

REINFORCED FLEXIBLE HOSE AND METHOD OF MAKING SAME

Field of Invention

The invention pertains to reinforced hoses. More particularly, the invention relates to plastic core hoses with braided reinforcing and protective outer coverings for use in plumbing applications and related uses.

Background of the Invention

A number of applications are best served by flexible hoses. Most notably, hoses connecting fixed plumbing outlets to vibrating machinery or appliances require the use of flexible hoses to prevent cracking and resultant leaks. Resilient materials including various types of rubber and plastic have been employed in situations requiring flexible hoses, however, a number of problems are typically encountered. The flexible materials employed in such hoses tend not to be as strong and resistant to higher pressures as solid, non-flexible materials. Further, such materials tend to stretch and further weaken under pressure, putting strain upon the points of attachment of these hoses to fittings and couplings. A number of methods have been developed to give flexible hoses the strength and durability needed while maintaining the required flexibility.

U.S. Patent No. 4, 699,178 issued to *Washkewicz* discloses a high burst strength flexible composite hose having low volumetric expansion under pressure includes a thermoplastic core tube, one or more braided reinforcing layers of high strength aramid yarn having a tensile modulus of elasticity of about 17,000,000 psi and a tenacity of more than 20 grams per denier at room temperature, and an outer cover of elastomeric material

U.S. Patent No. 4,111,237 issued to *Muntzner et al.* describes a hydraulic brake hose comprising a polychloroprene inner tube, a reinforcing braid of twisted glass fiber yarn around the tube, a styrene-butadiene copolymer rubber cushion layer over the glass braid, a second
5 reinforcing braid of nylon fiber yarn over the cushion layer and a cover layer of polychloroprene rubber.

U.S. Patent No. 5,803,129 issued to *Coronado et al.* discloses an improved reinforced hose for conducting fluids and gases, and a method of manufacturing that hose. The improved reinforced hose includes an interior tube having an inner bore and an outer surface. The
10 improved reinforced hose also includes an outer covering disposed directly about the outer surface of the interior tube. Such outer covering includes one or more layers of plastic threads, which are formed by disposing a plastic substance about core material.

U.S. Patent No. 5,381,834 issued to *King* describes a hose assembly of the type for carrying high-pressure fluids therethrough. The hose assembly includes a tubular member and
15 a pair of coupling members. The tubular member includes an inner liner of a fluorocarbon polymer. Yarns fabricated from fibers, including glass fibers and Aramid fibers, are braided together about the exterior of the inner liner to form a braided layer. The assembly further includes an outer fluorocarbon coating dispersed throughout the braided layer to prevent kinking or permanent deformation in the inner liner, in addition to preventing the crushing of
20 the yarns when the ends are crimped to receive the coupling members. A conductive strip is formed on the inner liner for dissipating electrical charges that may accumulate in the inner liner.

U.S. Patent No. 5,142,782 issued to *Martucci* describes a method of making a lightweight hose assembly including a step of extruding the inner liner. A nonmetallic material is then braided about the exterior of the liner. The inner liner and braided layer are then passed through a reservoir containing a solution of the fluorocarbon polymer. The solvent
5 is then removed, leaving a fluorocarbon polymer coating dispersed throughout the braided layer.

U.S. Patent No. 4,915,762 issued to *Berlincourt et al.* discloses a hose comprising an inner plastic tube covered by at least one braiding of filaments disposed in helically crossed layers around the inner tube, characterized in that the filaments are made of plastics and are so
10 deformed in their right cross-section that the gap between any two adjacent layers which extend in the same direction as one another is at least 100% filled. The invention also relates to a process for the production of the hose.

It is an objective of the present invention to provide a flexible hose capable of withstanding vibration and jarring. It is a further objective to provide a hose capable of
15 handling relatively high pressure without expanding in diameter. It is a still further objective of the invention to provide a hose that will not rust, corrode or oxidize. It is a final objective to provide a hose that may be easily and inexpensively manufactured in any desired length.

While some of the objectives of the present invention are disclosed in the prior art, none of the inventions found include all of the requirements identified.

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Summary of the Invention

(1) A reinforced flexible hose is provided. The hose has an interior tube for conducting either fluids or gases. The tube has an inner bore and an outer surface, at least one layer of stainless steel threads braided about the outer surface and a flexible polymeric covering. The covering is located over the stainless steel threads, thereby protecting them from abrasion and corrosion.

(2) In a variant, the interior tube is formed of synthetic polymer material.

(3) In another variant, the interior tube is formed of material selected from the following group: ethylene-propylene-compound diene, acrylonitrile-butadiene, synthetic resinous fluorine, nylon, thermoplastic polyester elastomer, polyurethane, polyvinyl chloride and rubber.

(4) In yet another variant, the stainless steel threads are grouped into distinct strands that are interwoven to form at least one braided layer of threads.

(5) In a further variant, the reinforced flexible hose has between about two and about nine stainless steel threads.

(6) In still a further variant, a gauge of the stainless steel threads ranges from about .002 inches to about .070 inches.

(7) In another variant, the stainless steel threads are located about the interior tube under tension and the tension ranges from about .5 pounds to about 3 pounds.

(8) In yet another variant, the flexible polymeric covering is formed of transparent material.

(9) In a further variant, the flexible polymeric covering is formed of material selected from the following group: ethylene-propylene-compound diene, acrylonitrile-butadiene,

synthetic resinous fluorine, nylon, thermoplastic polyester elastomer, polyvinyl chloride, polyurethane and rubber.

(10) In still another variant, the flexible polymeric covering is formed to fit tightly over the stainless steel threads so as to leave substantially no gap between the threads and the covering.

5 (11) In a final variant, the flexible polymeric covering is formed over the stainless steel threads so that an exterior surface of the covering will have a texture related to the stainless steel threads thereunder.

Description of the Drawings

10 **Figure 1** is a perspective view of the preferred embodiment of the invention illustrating stainless steel threads braided about an outer surface of a tube and a plastic polymeric covering; and

Figure 2 is cross-sectional view of the **Figure 1** embodiment illustrating a braided layer of steel threads and the plastic polymeric covering.

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Detailed Description of the Preferred Embodiment

(1) Referring to **figures 1 and 2**, a reinforced flexible hose **10** is provided. The hose **10** has an interior tube **15** for conducting either fluids or gases. The tube **15** has an inner bore **20** and an outer surface **25**, at least one layer of stainless steel threads **30** braided about
20 the outer surface **25** and a flexible polymeric covering **35**. The covering **35** is located over the stainless steel threads **30**, thereby protecting them **30** from abrasion and corrosion.

(2) In a variant, the interior tube **15** is formed of synthetic polymer material.

- (3) In another variant, the interior tube **15** is formed of material selected from the following group: ethylene-propylene-compound diene, acrylonitrile-butadiene, synthetic resinous fluorine, nylon, thermoplastic polyester elastomer, polyurethane, polyvinyl chloride and rubber.
- 5 (4) In yet another variant, the stainless steel threads **30** are grouped into distinct strands **40** that are interwoven to form at least one braided layer **45** of threads **30**.
- (5) In a further variant, the reinforced flexible hose **10** has between about two and about nine stainless steel threads **30**.
- (6) In still a further variant, a gauge of the stainless steel threads **30** ranges from about
10 .002 inches to about .070 inches.
- (7) In another variant, the stainless steel threads **30** are located about the interior tube **15** under tension and the tension ranges from about .5 pounds to about 3 pounds.
- (8) In yet another variant, the flexible polymeric covering **35** is formed of transparent material.
- 15 (9) In a further variant, the flexible polymeric covering **35** is formed of material selected from the following group: ethylene-propylene-compound diene, acrylonitrile-butadiene, synthetic resinous fluorine, nylon, thermoplastic polyester elastomer, polyvinyl chloride, polyurethane and rubber.
- (10) In still another variant, the flexible polymeric covering **15** is formed to fit tightly over
20 the stainless steel threads **30** so as to leave substantially no gap between the threads **30** and the covering **15**.

(11) In a final variant, the flexible polymeric covering **15** is formed over the stainless steel threads **30** so that an exterior surface **55** of the covering **15** will have a texture related to the stainless steel threads **30** thereunder.